Council of the European Union
General Secretariat

Interinstitutional files:
2024/0213 (NLE)

Brussels, 08 November 2024

WK 13239/2024 INIT

LIMITE

PECHE

This is a paper intended for a specific community of recipients. Handling and further distribution are under the sole responsibility of community members.

NOTE

From: To:	General Secretariat of the Council Delegations
N° Cion doc.:	ST 12844 2024 INIT + ST 12844 2024 ADD 1
Subject:	Proposal for a COUNCIL REGULATION fixing for 2025 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in the Baltic Sea and amending Regulation (EU) 2024/257, as regards certain fishing opportunities in other waters - Information from the Baltic Sea Member States

Delegations will find attached information received from the Baltic Sea Member States on the abovementioned subject.

A brief description of sprat spawning and implications for spawning closures in the central Baltic Sea

Summary

- Sprat spawning occur over large areas in and around the deep basins in the eastern parts of the central Baltic Sea (SD 26, 27 28 and 29), starting in January/February for 6-7 months.
- Sprat spawning dynamics and juvenile fish production are complex and related to a number of environmental factors such as salinity, temperature and water depth.
- The widespread spawning makes it difficult to pinpoint specific areas for a regulation of fishing in conjunction with spawning and any closure would preferably apply to the main central Baltic Sea.
- A possible regulation of fishing could be in areas deeper than 70 m in SD 26, 27, 28 and 29 during the period January-February to August, to cover as much of the spawning as possible.
- However, the effects of more temporary closures during spawning in all or parts of the central Baltic Sea are unclear, as temporarily protected individuals would probably be caught inside or outside the area during other parts of the year.
- A spawning closure for sprat could be adjusted to simultaneously protect spawning herring by limiting pelagic trawling during a closure.
- Nonetheless, studies/analyses on fisheries impact on sprat reproduction should be strengthened as ICES identifies a decline in biomass and in recruitment in recent years.

Background

Sprat is a pelagic fish that occurs mainly in open sea areas (Aro, 1989, Ojaveer and Kalejs 2010, Ojaveer 2017) and plays an ecologically central role in the Baltic Sea ecosystem, both as a predator of mesozooplankton and as food for cod (Möllmann et al., 2004, Laurien et al., 2024). The range of sprat in the Baltic Sea extends from the Belt Sea and the Western Baltic Sea to the Kvark area in the north and also to the north-eastern part of the Gulf of Finland (Aro, 1989, Figure 1). It is common in the southern and central Baltic Seas and less common in the Bothnian Sea. The International Council for the Exploration of the Sea (ICES) currently identifies two different stocks: one in the Baltic Sea (ICES subareas, 22-32) and one in the North Sea, Skagerrak and Kattegat (ICES area 4 and catch areas 3a). Sprat from the North Sea, Skagerrak and Kattegat have similar genetic signals, suggesting that they originate from the same stock (ICES 2018). Limborg et al. (2009) showed that spawning sprat from Arkonabassängen, Bornholmsbassängen and Gdanskdjupet are genetically different. Nevertheless, due to the large and unclear migration and mix of different spawning stocks, sprat in the Baltic Sea is assessed and managed as a single stock (Ojaveer and Kalejs, 2010).

Sprat is fished by many countries around the Baltic Sea and is particularly economically important for Poland, Russia, Sweden and Denmark (ICES, 2024a). The spatial distribution of sprat catches has remained relatively stable over the last 20 years, with 42, 21 and 14 % fished in the respective ICES subareas (SD) 26, 28 and 25 (ICES 2024a).

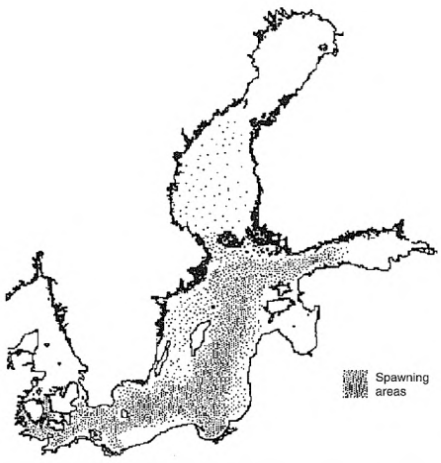

Figure 1. *Description of distribution and where it was assumed that sprat spawned in the 1970s. From Raimo et al. 1994.*

Sprat spawning in different sub divisions of the central Baltic Sea

The main foraging season in the central and southern Baltic is from July to November, when sprat migrates after spawning towards deeper areas of the Baltic Sea (Figure 2, Aro, 1989; Möllmann et al., 2004). Although migration routes between foraging and spawning areas have been suggested, the details of these routes, including how far the different spawning populations migrate, are not fully mapped (Aro, 1989). According to previous estimates, sprat was spread over large parts of the Baltic Proper, including the Bothnian Bay, and its wide distribution also described potential spawning grounds (Figure 1).

Like many other pelagic species, sprat is a batch spawner, meaning that it releases its eggs during a protracted spawning season, and where the eggs are pelagic (Alheit, 1988). It should be noted that the spawning dynamics of sprat in relation to environmental factors are complex (Haslob et al., 2013). For example, the timing of spawning has been shown to be linked to temperature conditions (Karasiova, 2002) and the proportion of active spawning sprat females varies during the spawning period (Kraus and Köster 2004). Sprat usually spawns pelagically in the deep basins of the central Baltic Sea and on the coastal slopes of the depths, in addition to Kiel Bay, Mecklenburg Bay, Arkonaba Bed, Bornholm Basin and Gdansk Deep (Figure 2, Aro, 1989; Ojaveer and Kalejs, 2009). Recent fisheries surveys show that sprat no longer spawns in the Gulf of Finland (ICES, 2024b).

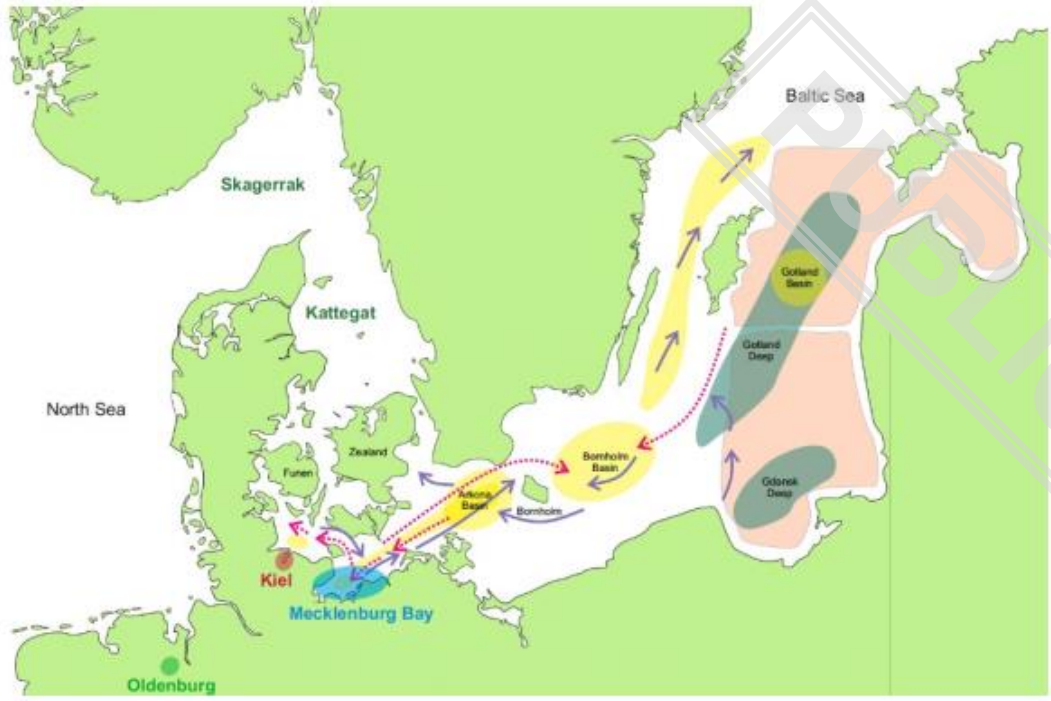

Figure 2. *Sprat migrations. During July-November, adult sprat migrates in the western and central Baltic Sea to seek food (purple arrows) from the coastal areas to the deeper parts of the Baltic Sea towards the Bornholm Basin. The spawning in the western Baltic takes place from January-February to August, and the sprat migrates to its spawning grounds (yellow) in Kiel Bay, Mecklenburg Bay, Arkona basin, Bornholms basin Gdansk Deep and Gotland Deep. Assumed spawning migration (dashed red arrows) and foraging/winter migration (solid purple arrows) are displayed. Grey-green shading: foraging areas; Red shading: wintering areas; The map is taken from Laurien et al., (2024) which in turn modified it from Aro (1989).*

The spawning season in the Baltic Sea begins in February-March and lasts until July-August and is usually longer in the southern parts of the Baltic Sea than in the northern Baltic Sea (Aro, 1989, Ojaveer and Kalejs, 2010), although spawning individuals have been detected as early as January in the southern and central Baltic Sea (Haslob et al., 2013). The spawning is generally most intense between May and June, but cold winters can delay it (Karasiova, 2002). A second spawning peak was observed in autumn 2003 after exceptionally warm water temperatures during the summer (Kraus et al., 2004). Further north, spawning begins later in the year, but it is more uncertain. In spring the sprat spawns near the bottom and in summer they tend to spawn in the surface layers above deeper waters (Aro, 1989). Recruitment is partly dependent on salinity and levels below 8 per mille impair the egg survival of sprat (Petereit et al., 2009). Thus, spawning takes place mainly in the western Baltic Sea and in the deep basins of the central Baltic Sea where the salinity is appropriate (Aro 1989; Baumann et al., 2006). Essential fish habitat (EFH) map on Potential spawning areas for sprat in the PanBalticScope project, co-founded by the European Maritime and Fisheries Fund of the European Union; http://www.panbalticscope.eu/), potential spawning grounds for sprat would be demarcated as salinity > 6 and water depth > 30 m, but for the depth of the Arcona basin > 20 m (Figure 3). "High probability spawning grounds" were demarcated for areas deeper than 70 m. However, Alekseev and Alekseeva (2005) reported that the spawning of sprat can shift from below the haloline (30-60m) at the beginning of the spawning period to surface water layers towards the end of the spawning season, highlighting that the information on spawning of sprat is variable and thus not fully understood. Furthermore, it has been demonstrated that sprat juvenile fish

production (ICES, 2024a) is not directly linked to spawning stock biomass, but is probably driven by a range of interacting environmental factors (Köster et al., 2003, MacKenzie and Köster, 2004, Petereit et al., 2009).

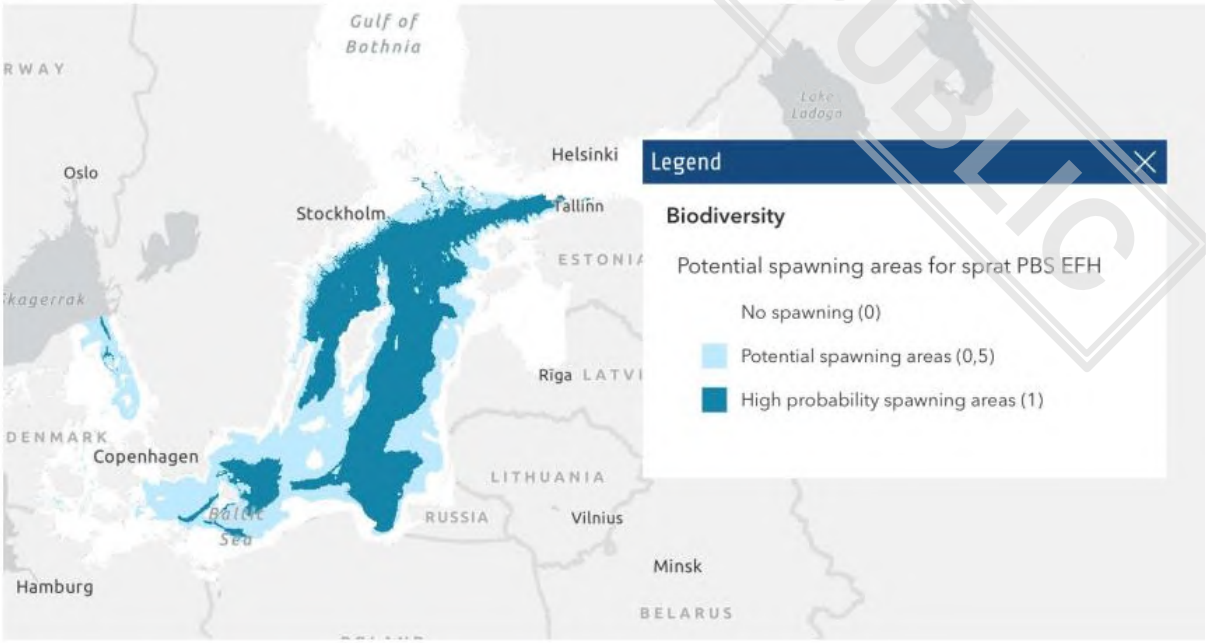

Figure 3. *The map is based on literature and environmental variables, not actual data on sprat spawning. The map can overestimate the spawning area west and north of Gotland. The data layers for environmental variables are based on modelling. Essential fish habitat (EFH) map on potential spawning areas for sprat (http://www.panbalticscope.eu/).*

Spatial and temporal considerations of sprat pawning closures in the central Baltic Sea

As spawning occurs over a long period of time and over a large area, it is difficult to identify a specific area for a regulation of fishing in connection with spawning and, from a precautionary principle, the regulation should preferably apply to the entire central Baltic Sea. A possible regulation of fishing should at least cover areas deeper than 70 m in SD 26, 27, 28 and 29 during the period February to August to cover as much of the spawning period as possible.

In general, however, the impact of time-limited closures on sprat stocks, including juvenile fish production, is unclear. Knowledge of the specific migration patterns of sprat and its division into different spawning grounds is limited. With the general knowledge that it makes longer annual migrations to and from different spawning and foraging areas, it is unclear how well such a measure would protect spawning sprat. This is because sprat can be caught outside the area during other parts of the year. A time-limited closed area would therefore probably not achieve a reduction in yearly catches, but a temporary protection of the fish when it is in particularly sensitive areas. Possible effects could then be that sexually mature individuals are not caught when they are in protected spawning grounds, thus providing an increased chance of reproduction and thus increased recruitment. Until we know more about the migration patterns and mixtures of the different spawning stocks, and the relationship between juvenile fish production and environmental factors, however, this effect cannot be ensured.

Adapting sprat spawning closures to also protect spawning herring

Although sprat appears to dominate catches in deeper parts of SD 25, 26, 28 and 29, sprat is caught together with herring to a varying extent in different areas (ICES 2023). This means that a spawning closure of sprat, if it were to cover the entire central Baltic Sea, would have to severely restrict pelagic fisheries as a whole, thereby also limiting herring catches. The lengthy spawning period of the sprat also includes the times when the herring spawns. Spawning closures in combination with reduced fishing pressure provides good chances to ensure a long-term sustainable spawning biomass and thus the opportunity for good juvenile fish production.

If a spawning closure for sprat were limited to areas deeper than 70 m in SD 26, 27, 28 and 29 during a period of high pelagic fishing (i.e. late autumn and spring-winter), there is a risk that this fishing effort would shift closer to the coast, which would increase the fishing pressure on herring in shallower areas. In other words, a spatially limited sprat fishery carries a high risk of increased fishing pressure on herring. Limiting sprat fisheries to areas deeper than 70 m would also pose possible issues for control and enforcement.

Related references

Alheit, J. (1988). Reproductive biology of sprat (Sprattus sprattus): factors determining annual egg production. J. Du Conseil 44, 162-168. doi:10.1093/ icesjms/44.2.162.

Aro, E. (1989). A review of fish migration patterns in the Baltic. Rap. Proc. Verb. Ré. Cons. Int. Explor. More 190, 72-96.

Baumann, H., Hinrichsen, H.-H., Malzahn, A., 2006. Recruitment variability in Baltic Sea sprat (Sprattus sprattus) is tightly coupled to temperature and transport patterns affecting the larval and early juvenile stages. Can. J. Fish. The aquat. Sci. 2201, 2191-2201. http://dx.doi.org/10.1139/F06-112.

Haslob, H., Rabade-Uberos, S., Saborido-Rey, F., 2013. Seasonal variability of fecundity and spawning dynamics of Baltic sprat. Fish. Travel. 138, 99-109. http://dx.doi.org/10.

Hinrichsen H-H, Kraus G, Voss R, Stepputtis D, Baumann H, 2005a. The general distribution pattern and mixing probability of Baltic sprat juvenile populations. Journal of Marine Systems, 58, 52-66.

ICES. 2018. Report of the Benchmark Workshop on Sprat (WKSPRAT), 5-9 November 2018. Copenhagen: International Council for the Exploration of the Sea; 2018. ICES CM; 2018/ACOM:35. https://doi.org/10.17895/ices.pub.19291145.v1

ICES. 2023. Benchmark Workshop on Baltic Pelagic stocks (WKBBALTPEL). ICES Scientific Reports. 5:47. 350 pp. https://doi.org/10.17895/ices.pub.23216492

ICES 2024a. Baltic Fisheries Assessment Working Group (WGBFAS). ICES Scientific Reports. Report. https://doi.org/10.17895/ices.pub.25764978.v3

ICES 2024b. Baltic International Fish Survey Working Group (WGBIFS). ICES Scientific

Reports. 6:55. 113 pp. https://doi.org/10.17895/ices.pub.25922290.

Kraus, G., Köster, F.W., 2004. Estimating Baltic sprat (Sprattus sprattus balticus S.) population sizes from egg production. Fish. Travel. 69, 313-329.

Köster, F.W., Möllmann, C., Neuenfeldt, S., Vinther, M., St. John, M.A., Tomkiewicz, J., Voss, R., Hinrichsen, H.-H., Kraus, G., Schnack, D., 2003a. Fish stock development in the central Baltic Sea (1976-2000) in relation to variability in the environment. ICES Marine Science Symposia 219, 294-306.

Limborg, M.T., Pedersen, J.S., Hemmer-Hansen, J., Tomkiewicz, J., Bekkevold, D., 2009. Genetic population structure of European sprat Sprattus sprattus: differentiation across a steep environmental gradient in a small pelagic fish. Mar. Ecol. Prog. Look at it. 379, 213-224. http://dx.doi.org/10.3354/meps07889.

MacKenzie, B.R., Köster, F.W., 2004. Fish production and climate: Scattered in the Baltic Sea. Ecology 85 (3), 784-794.

Mollmann, C., Kornilovs, G., Fetter, M. and Koster, F.W. (2004). Feeding ecology of central Baltic Sea herring and sprat. J. Fish Biol. 65, 1563-1581. doi:10.1111/j. 0022-1112.2004.00566.x.

Ojaveer, E. (2017). Ecosystems and Living Resources of the Baltic Sea. New York: Springer Berlin Heidelberg.

Ojaveer, E. and Kalejs, M. (2010). Ecology and long-term forecasting of sprat (Sprattus sprattus balticus) stock in the Baltic Sea: A review. Rev. Fish Biol. Fisher 20, 203-217. doi:10.1007/s11160-009-9130-5

Parmanne, Raimo, Otto Rechlin, and Bengt Sjöstrand. "Status and future of herring and sprat stocks in the Baltic Sea." Dana 10.1994 (1994): 29-59.

Petereit, C., Hinrichsen, H.-H., Voss, R., Kraus, G., Freese, M., Clemmesen, C., 2009. The influence of different salinity conditions on egg buoyancy and development and yolk sac larval survival and morphometric traits of Baltic Sea sprat (Sprattus sprattus balticus Schneider). Sci. Mar. 73, 59-72. http://dx.doi.org/10.3989/scimar.2009.73s1059

Vitale, F., Mittermayer, F., Krischansson, B., Johansson, M., Casini M., 2015. Growth and maturity of sprat (Sprattus sprattus) in the Kattegat and Skagerrak, eastern North Sea Aquat. Living Resour. 28 (2-4) 127-137 (2015) DOI: 10.1051/alr/2016007

Vitale, F. and Bartolino, V. Genetic studies of sprat (*Sprattus sprattus)*in the Skagerrak and Kattegat. Swedish Agency for Marine and Water Management Report, Dr 2687-21, 23 pages.